Topic: Half life

Question: Find the decay constant.

Americium-241 has a half-life of 432 years.

Answer choices:

A 0.160

B 0.0160

C 0.00160

D 0.000160

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Solution: C

Normally we use the exponential decay equation

$$y = y_0 e^{-rt}$$

where y is the final amount of substance, y_0 is the initial amount of substance, r is the rate of decay and t is time (which is the half-life in this case).

But since we're simply solving for the decay constant and we already know the half-life of the element, we can use the simpler equation

$$r = \frac{\ln 2}{t}$$

and plug in the given value of time, $t = 432$.

$$r = \frac{\ln 2}{432}$$

$$r = 0.00160$$

The decay constant of Americium-241 that has a half-life of 432 years is $r = 0.00160$.

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Topic: Half life

Question: Find half life.

Carbon-19 has a decay constant of 0.000121.

Answer choices:

A $5{,}782$ years

B $5{,}728$ years

C $5{,}278$ years

D $5{,}827$ years

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Solution: B

Normally we use the exponential decay equation

$$y = y_0 e^{-rt}$$

where y is the final amount of substance, y_0 is the initial amount of substance, r is the rate of decay and t is time (which is the half-life in this case).

But since we're simply solving for the decay constant and we already know the half-life of the element, we can use the simpler equation

$$t = \frac{\ln 2}{r}$$

and plug in the given decay constant, $r = 0.000121$.

$$t = \frac{\ln 2}{0.000121}$$

$$t = 5{,}728$$

The half-life of Carbon-19 which has a decay constant of 0.000121 is $t = 5{,}728$ years.

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Topic: Half life

Question: Find the decay constant.

Plutonium-239 has a half-life of $24{,}110$ years.

Answer choices:

A 0.0000287

B 0.000287

C 0.000000287

D 0.00000287

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Solution: A

Normally we use the exponential decay equation

$$y = y_0 e^{-rt}$$

where y is the final amount of substance, y_0 is the initial amount of substance, r is the rate of decay and t is time (which is the half-life in this case).

But since we're simply solving for the decay constant and we already know the half-life of the element, we can use the simpler equation

$$r = \frac{\ln 2}{t}$$

and plug in the given value of time, $t = 24{,}110$.

$$r = \frac{\ln 2}{24{,}110}$$

$$r = 0.0000287$$

The decay constant of Plutonium-239 that has a half-life of $24{,}110$ years is $r = 0.0000287$.

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